

Office Action Dated January 26, 2009

Application No. 10/552,163

Attorney Docket No. 82062-0177

Response Dated April 14, 2009

CLAIMS

1. (Currently amended) A process for the production of a non-woven, comprising the following manufacturing steps; a) preparing at least one layer (T_1) of splittable multi-component polymer fibers and at least one layer of cellulose pulp fibers (T_3); b) hydro-entangling said at least one layer of splittable multi-component polymer fibers and said at least one layer of cellulose pulp fibers (T_3) such as to obtain a non-woven where the multi-component polymer fibers are split into mono-component micro-fibers entangling with one another, wherein the said at least one layer (T_1) of splittable multi-component polymer fibers has not been previously subjected to a bonding step.

2. (Original) The process according to claim 1, wherein step a) comprises: preparing at least one layer (T_1) of splittable multi-component polymer fibers; laying at least one layer of fibers of absorbent material (T_3) on said at least one layer (T_1), whereby the hydro-entangling step b) takes place such as to obtain a non-woven where the multi-component polymer fibers which are split into mono-component micro-fibers entangle both with one another and the fibers of the absorbent material.

3. (Original) The process according to claim 1, wherein step a) comprises: preparing at least one layer (T_1) of splittable multi-component polymer fibers; laying at least one layer of fibers of absorbent material (T_3) on said at least one layer (T_1); laying at least one further layer (T_2) of splittable multi-component polymer fibers on said at least one layer of fibers of absorbent material, whereby the hydro-entangling step b) takes place such as to obtain a multi-layer non-woven where the multi-component polymer fibers are split into individual mono-component micro-fibers entangling both with one another and the fibers of the absorbent material.

4. (Original) The process according to claim 1, wherein said step a) is made through separate extrusion of at least two polymers by a suitable spinneret (5,7,11,15) below which said at least two polymer components are linked such as to form a single splittable multi-component fiber.

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5. (Original) The process according to claim 4, wherein said splittable multi-component fiber is obtained by spinning and subsequently linking up to 16 continuous threads of different polymers.

6. (Original) The process according to claim 1, wherein said polymer fibers derive from at least two threads of a single polymer up to 16 threads of different polymers, be they homopolymers, copolymers or mixtures thereof.

7. (Original) The process according to claim 6, wherein said polymers are selected from polyesters, polyamides, polyolefins, polyurethane, polyester modified with additives, polypropylene, polyethylene, polypropylene terephthalate, polybutylene terephthalate.

8. (Original) The process for the production of a non-woven, comprising the following manufacturing steps; i) preparing at least one layer (T_1) of exploded polymer fibers; ii) hydro-entangling said at least one layer such as to obtain a non-woven where the polymer fibers are exploded into micro-fibers entangling with one another.

9. (Original) The process for the production of a non-woven according to claim 8, wherein step i) comprises: preparing at least one layer (T_1) of exploded polymer fibers; laying at least one layer of fibers of absorbent material (T_3) on said at least one layer (T_1), whereby the hydro-entangling step ii) takes place such as to obtain a non-woven fiber where the polymer fibers exploded into micro-fibers entangle both with one another and the fibers of the absorbent material.

10. (Original) The process according to claim 8, wherein step i) comprises: preparing at least one layer (T_1) of exploded polymer fibers; laying at least one layer of fibers of absorbent material (T_3) on said at least one layer ($T_{\text{sub.}1}$); laying at least one further layer (T_2) of exploded polymer fibers on said at least one layer of fibers of absorbent material, whereby the hydro-entangling step ii) takes place such as to obtain a multi-layer non-woven in which the polymer fibers exploded into individual micro-fibers entangle both with one another and the fibers of the absorbent material.

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11. (Previously presented) The process according to claim 8, wherein the exploded polymer fibers are obtained through the passage of polymer fibers through a Laval nozzle.

12. (Previously presented) The process according to claim 8, wherein the polymers of the exploded fibers are selected from natural or synthetic polymers.

13. (Previously presented) The process according to claim 12, wherein the natural polymers are selected from cellulose, Lyocell and PLA, whilst the synthetic polymers are selected from polypropylene, polyethylene, polyamide and polyester.

14. (Previously presented) The process according to claim 2, wherein said laying of absorbent material fibers takes place with cellulose pulp fibers.

15. (Previously presented) The process according to claim 9, wherein said laying of absorbent material fibers takes place with cellulose pulp fibers.

16. (Previously presented) The process according to claim 1, further comprising a drying step after the hydro-entangling step.

17. (Previously presented) The process according to claim 8, further comprising a drying step after the hydro-entangling step.

18. (Previously presented) The process according to claim 16, further comprising a step of winding the non-woven fabric onto a roller after said drying step.

19. (Previously presented) The process according to claim 17, further comprising a step of winding the non-woven fabric onto a roller after said drying step.

20. (Previously presented) The process according to claim 2, further comprising a pre-hydro-entangling step after said step of preparing at least one layer (T_1) of polymer fibers.

21. (Previously presented) The process according to claim 9, further comprising a pre-hydro-entangling step after said step of preparing at least one layer (T_1) of polymer fibers.

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22. (Previously presented) The process according to claim 20, further comprising a drying step after said pre-hydro-entangling step.

23. (Previously presented) The process according to claim 21, further comprising a drying step after said pre-hydro-entangling step.

24. (Previously presented) The process according to claim 16, further comprising a dewatering step simultaneous or subsequent to said drying step.

25. (Previously presented) The process according to claim 17, further comprising a dewatering step simultaneous or subsequent to said drying step.

26. (Previously presented) The process according to claim 18, further comprising a thickening step before the winding step.

27. (Previously presented) The process according to claim 19, further comprising a thickening step before the winding step.

28. (Previously presented) The process according to claim 26, wherein said thickening step takes place through calendering or hydro-entangling.

29. (Previously presented) The process according to claim 27, wherein said thickening step takes place through calendering or hydro-entangling.

30. (Previously presented) The process according to claim 1, wherein air is sucked at a temperature equal to or lower than room temperature through said polymer fibers in order to cool and cure them.

31. (Previously presented) The process according to claim 8, wherein air is sucked at a temperature equal to or lower than room temperature through said polymer fibers in order to cool and cure them.

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32. (Previously presented) The process according to claim 8, wherein said exploded fibers are humidified before being hydro-entangled.

33. (Previously presented) The process according to claim 1, further comprising a non-woven finishing step.

34. (Previously presented) The process according to claim 8, further comprising a non-woven finishing step.

35. (Previously presented) The process according to claims 1, further comprising a multicolor printing step of the non-woven.

36. (Previously presented) The process according to claims 8, further comprising a multicolor printing step of the non-woven.

37. (Previously presented) The process according to claim 2, wherein each preparation step of the polymer fibers and laying of the fibers of absorbent material is made on a support (S) having a surface comprising sections with a profile substantially perpendicular to the vertical laying flow of the fibers interspaced by sections with an inclined profile of 10.degree.-50.degree. in relation to said vertical flow.

38. (Previously presented) The process according to claim 9, wherein each preparation step of the polymer fibers and laying of the fibers of absorbent material is made on a support (S) having a surface comprising sections with a profile substantially perpendicular to the vertical laying flow of the fibers interspaced by sections with an inclined profile of 10⁰-50⁰ in relation to said vertical flow.

39. (Currently amended) A hydro-entangled single- or multi-layer non-woven produced by a process comprising the steps of:

preparing at least one layer (T₁) of splittable multi-component polymer fibers and at least one layer of cellulose pulp fibers (T₃); and

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hydro-entangling said at least one layer of splittable multi-component polymer fibers and said at least one layer of cellulose pulp fibers (T₃) such as to obtain a non-woven where the multi-component polymer fibers are split into mono-component micro-fibers entangling one another, wherein the said at least one layer (T₁) of splittable multi-component polymer fibers has not been previously subjected to a bonding step.

40. (Currently amended) A hydro-entangled single- or multi-layer non-woven produced by a process comprising the steps of:

preparing at least one layer (T₁) of exploded polymer fibers and at least one layer of cellulose pulp fibers (T₃); and

hydro-entangling said at least one layer of exploded polymer fibers and said at least one layer of cellulose pulp fibers (T₃) such as to obtain a non-woven where the multi-component polymer fibers are split into mono-component micro-fibers entangling one another, wherein the said at least one layer (T₁) of exploded polymer fibers has not been previously subjected to a bonding step.

41. (Previously presented) The non-woven fabric according to claim 39, comprising at least one micro-fiber layer.

42. (Previously presented) The non-woven fabric according to claim 40, comprising at least one micro-fiber layer.

43. (Previously presented) The non-woven fabric according to claim 41, wherein said micro-fibers have a diameter of between 0.1 dTex and 0.9 dTex.

Claims 44-45 (Cancelled).

46. (Previously presented) The non-woven according to claim 44, wherein said micro-fibers have a diameter of between 1 and 5 micron.

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47. (Previously presented) The non-woven according to claim 45, wherein the weight in grams per meter is between 50 and 70, the tensile strength in the machine direction expressed in Newton per 5 cm (N/5 cm) is between 50 and 150, whereas in the cross-direction of between 20 and 75, the elongation calculated as a percentage in relation to the length in a relaxed state is between 35% and 85% in machine direction (MD), whereas it is between 70% and 100% in the cross-direction (CD), the final content of the cellulose pulp fiber is between 50% and 75% by weight of the total weight of the non-woven, the absorption power calculated as a percentage of the total weight of the weight of the dry non-woven is between 600% and 700%.

48. (Previously presented) The non-woven according to claim 46, wherein the weight in grams per meter is between 50 and 70, the tensile strength in the machine direction expressed in Newton per 5 cm (N/5 cm) is between 50 and 150, whereas in the cross-direction of between 20 and 75, the elongation calculated as a percentage in relation to the length in a relaxed state is between 35% and 85% in machine direction (MD), whereas it is between 70% and 100% in the cross-direction (CD), the final content of the cellulose pulp fiber is between 50% and 75% by weight of the total weight of the non-woven, the absorption power calculated as a percentage of the total weight of the weight of the dry non-woven is between 600% and 700%.

49. (Previously presented) The non-woven according to claim 45, wherein said non-woven is of a three-layer type having a total weight in grams of between 48 and 65, a weight of the upper layer in grams per square meter of between 11 and 13, a weight of the inner layer of cellulose pulp fiber of between 26 and 39 grams per square meter, a weight of the lower layer in grams per square meter of between 11 and 13, a MD tensile strength of between 18 and 27 N/5 cm, a CD tensile strength of between 7 and 14 N/5 cm and a thickness of between 0.40 and 0.65 mm.

50. (Previously presented) The non-woven according to claim 46, wherein said non-woven is of a three-layer type having a total weight in grams of between 48 and 65, a weight of the upper layer in grams per square meter of between 11 and 13, a weight of the inner layer of cellulose pulp fiber of between 26 and 39 grams per square meter, a weight of the lower layer in

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grams per square meter of between 11 and 13, a MD tensile strength of between 18 and 27 N/5 cm, a CD tensile strength of between 7 and 14 N/5 cm and a thickness of between 0.40 and 0.65 mm.

51. (Previously presented) Use of splittable or exploded multi-component polymer fibers for the production of a single- or multi-layer non-woven.

52. (Previously presented) The use according to claim 50, wherein said multi-layer non-woven comprises one layer of absorbent material fibers between two layers of split or exploded multi-component polymer fibers.